THE OFFICE OF THE STATE CHIEF INFORMATION OFFICER
ENTERPRISE TECHNOLOGY STRATEGIES

North Carolina Statewide Technical Architecture

Implementation Guidelines:
Network Architecture

STATEWIDE TECHNICAL ARCHITECTURE

Implementation Guidelines: Network Architecture

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Introduction

The intent of this document is to provide general implementation guidelines within the network technology domain. This will help ensure that the State of North Carolina adopts uniform and consistent implementation network solutions across the state enterprise.

The key goal of this document is to outline implementation guidelines that, when followed by the solution developers, will lead to a well-designed network solution that has the flexibility to grow with changes in technology and can be maintained in an efficient and effective manner. This is a fundamental principle of the North Carolina Statewide Technical Architecture.

This implementation guild is currently being revised both to better reflect the state of technology and improve upon existing architectural guidelines to better support state agency initiatives.

Implementation Guidelines

Implementation Guidelines for Local Area Networks (LANs).

Guideline 1: Configure the topology (physical wiring) in a Star pattern.

Rationale

- Star topology uses a central hub/switch to which each network device is connected.
- Problems with a connection in a star network only affect that one device.
- A star topology provides the capability to easily add and remove devices as necessary.
- A star topology responds well to dynamic infrastructure changes in order to meet the growing demands of data movement. With ever increasing demands of information movement, more data, secure paths, new paths, and faster access, a star topology allows different, changeable, connections.

Guideline 2: Use switched multi-segment design with managed hubs.

Rationale

- The hub is an ideal point for network management due to its central location and because all network traffic flows through it.
- Network switches provide the ability to break a network up into smaller sub-network segments.
- Switches can be used in conjunction with hubs.
- They improve LAN performance. With switching, network traffic is balanced across multiple segments thus reducing resource contention and increasing throughput capacity.
- Switching allows networks to assign increased speed or performance capability to particular segments in order to respond to heavy usage or application requirements.

Implementation Approach for LANs

Avoid New Deployment Migrate from Technology	Current Technology Direction	Emerging Technology
Bus or Ring topology	Star topology	
Token Ring protocol	10BaseT Ethernet	100BaseT Ethernet, Gigabit Ethernet, or ATM
Coaxial Cable	Category 5 UTP	Category 6, Category 7, or Fiber optics
Single segment design with unmanaged hubs	Switched, multi-segment design with managed hubs	Dynamic switching to the desktop
IPX protocol	IP	ATM

Table 1 - Implementation Approach for LANs

Implementation Guidelines for Wide Area Networks (WANs)

Guideline 3: Configure WAN protocols using TCP/IP.

Rationale

- Open protocol.
- Allows Internet access.
- Allows creation of Intranets and Virtual Private Networks (VPNs).

Implementation Approach for WANs

Avoid New Deployment Migrate from Technology	Current Technology Direction	Emerging Technology
SNA, DECnet, X.25, proprietary protocols, etc.	TCP/IP	IP Switching, ATM, SONET

Table 2 - Implementation Approach for WANs

Implementation Guidelines for Network-Centric Applications

Guideline 4: Use asynchronous rather than synchronous communications between application components (except in cases where business rules require synchronous communications).

Rationale

- Asynchronous communications will allow faster application processing, because the application is not waiting on a server response.
- Will allow applications to be used on "slower" WAN links.
- Work can occur at the application site even if the network links is down.

Guideline 5: Where business rules allow, use off-peak hours for scheduled data transfers.

Rationale

- Allows better utilization of network resources.
- Keeps large data transfers from impacting normal operations and WAN/LAN traffic.
- Will allow commits of a day's worth of work to be processed at one time increasing server response.

Guideline 6: Code applications to middleware APIs where there are no specific business requirements (e.g., wireless).

Rationale

- Makes the application network neutral.
- It isolates the application code from the network specific code so business rules and data access code can be redeployed on a different platforms, if necessary.
- Allows networks to remain scaleable and portable.

Implementation Approach for Network-Centric Applications

Avoid New Deployment Migrate from Technology	Current Technology Direction	Emerging Technology
Synchronous communications	Asynchronous communications	
Real-time updates to replicated databases	Off-hours, scheduled data transfers	
Coding to network API	Code to middleware API.	

Table 3 - Implementation Approach for Network-Centric Applications